C726

LIBRARY
MAR 11 1981
National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii

A BRIEF INTRODUCTION TO THE FISHERIES OF CHINA

by

Zhu De-Shan

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
February 1980

PREPARATION OF THIS CIRCULAR

This report has been prepared under a consultancy arrangement with the State General Administration of Aquatic Products. The author is Head of the Resource Section at the Yellow Sea Aquatic Products Institute at Qingdao. The Annex tables have been prepared in FAO on the basis of the material provided by Mr. Zhu De-Shan and following discussions with him during a visit to FAO Headquarters in February 1980.

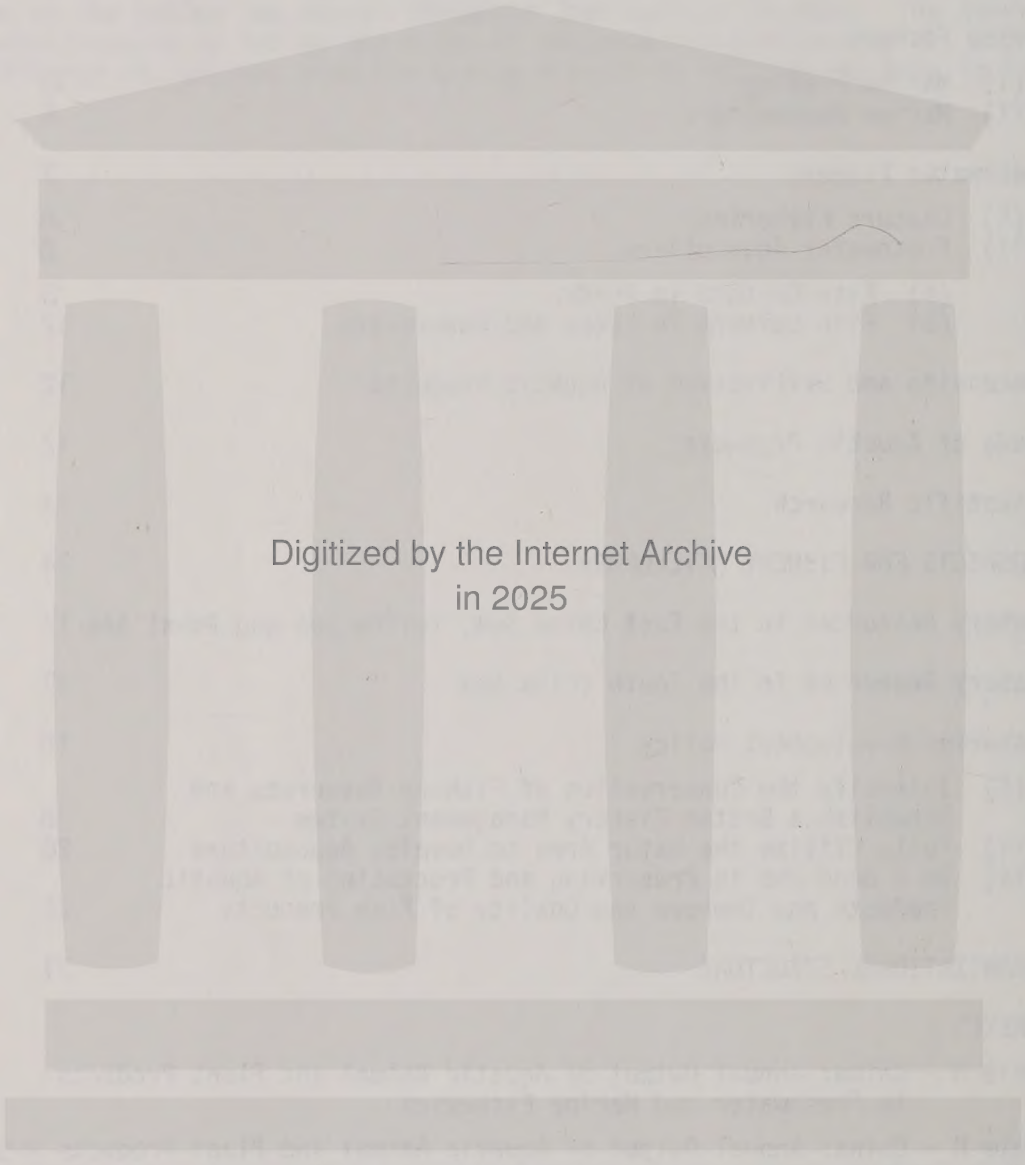
W/N6356

FAO FISHERIES CIRCULAR (FAO Fish.Circ.)

A vehicle for distribution of short or ephemeral notes, lists, statistical tabulations, etc., including provisional versions of documents to be issued later in other series.

CONTENTS

	Page No.
PRESENT STATE OF THE FISHERIES	1
General Situation	1
Marine Fishery	2
(i) Marine Fishing	3
(ii) Marine Aquaculture	5
Freshwater Fishery	7
(i) Capture Fisheries	8
(ii) Freshwater Aquaculture	8
(a) Fish Culture in Ponds	9
(b) Fish Culture in Lakes and Reservoirs	12
Processing and Utilization of Aquatic Products	12
Trade of Aquatic Products	12
Scientific Research	13
PROSPECTS FOR FISHERY DEVELOPMENT	14
Fishery Resources in the East China Sea, Yellow Sea and Pohai Sea	14
Fishery Resources in the South China Sea	17
Fisheries Development Policy	18
(i) Intensify the Conservation of Fishery Resources and Establish a Better Fishery Management System	18
(ii) Fully Utilize the Water Area to Develop Aquaculture	20
(iii) Do a Good Job in Preserving and Processing of Aquatic Products and Improve the Quality of Fish Products	21
ORGANIZATIONAL STRUCTURE	21
ANNEXES	
Table A - China: Annual Output of Aquatic Animal and Plant Products in Freshwater and Marine Fisheries	
Table B - China: Annual Output of Aquatic Animal and Plant Products through Catching and Aquaculture	
Table C - China: Annual Output of Aquatic Animal and Plant Products by Species and Fishery	
Table D - China: Reference List of Principal Inland and Marine Species	
MAP - China and Adjacent Seas	



Digitized by the Internet Archive
in 2025

https://archive.org/details/fao-fisheries-and-aquaculture-circular_1980_726

PRESENT STATE OF THE FISHERIES

General Situation

1. China covers tropical, subtropical, temperate and frigid-temperate zones. Facing the Pohai Sea, Yellow Sea, East China Sea and South China Sea both on the East and on the South, she possesses a coast line of 18,000 km. China has a criss-cross network of rivers, lakes and reservoirs spread all over the country with a total water area of 17 million ha, of which 5 million ha are suitable for fish farming.

2. China's fishery resources are comparatively rich. There are more than 1,000 species of economically important aquatic animals and plants. According to the present sources, there are 860 species of fish in the South China Sea, 442 species in the East China Sea, 201 species in the Yellow Sea and Pohai Sea and about 700 species of inland freshwater fish. The vast majority of fish in the South China Sea and East China Sea belong to the tropical and subtropical species. Due to the cold currents and cold water mass along the coast of the central and northern parts of the Yellow Sea, cold water species are dominant, such as cod (Gadus macrocephalus), Pacific herring (Clupea pallasi), flounder (Paralichthys olivaceus) and plaice (Cleisthenes herzensteini). Temperate water fish are the major species in the southern part of the Yellow Sea. Carps are the major species of inland freshwater fish.

3. The Chinese fish farmers, long engaged in fish production from ancient times, have accumulated rich experience both in fish farming and fish capture. After the founding of the People's Republic of China, under the leadership of the Chinese Communist Party and the Government, the broad masses of fishermen responded to the great call by Chairman Mao "To Get Organized". They gradually took the socialist collective road from individual fishing, through mutual aid teams, cooperatives to people's communes. Meanwhile the socialist state-run fishery enterprises have grown steadily. With the progress of science and technology, motorized fishing vessels were developed and marine fish productivity was increased. The success of artificial breeding of black carp, grass carp, silver carp and bighead carp gave an impetus to the development of freshwater fish farming. A breakthrough in the techniques of cultivation of laver, kelp and oyster seed led to the promotion of aquaculture both in the inter-tidal zone and in inshore waters.

4. In 1978 there were 4.3 million fishermen and 2.45 million other fishery workers in the whole country. Now China possesses more than 47,000 motorized fishing vessels with a total of some 2.9 million hp. In 1977 total production of aquatic products reached a record of about 4.7 million tons but in 1978 fell to 4.65 million tons (for details see Table 1). The composition of the total yield of aquatic products is: three quarters of the yield comes from marine sources and one quarter from freshwaters; of production from freshwaters 75 percent comes from capture fisheries and one quarter from aquaculture.

Table 1: China's Yield of Aquatic Products 1970-1978

....'000 tons...

Year	Total Annual Yield	Marine Fish 1/ Yield			Freshwater Fish Yield		
		subtotal	capture	farming	subtotal	capture	farming
1970	3,184.5	2,280.8	2,097.2	183.6	903.7	321.7	582.0
1971	3,495.9	2,560.0	2,330.6	229.4	935.9	315.9	620.0
1972	3,842.3	2,914.5	2,658.6	255.9	927.8	306.7	621.1
1973	3,931.0	2,911.2	2,690.6	220.6	1,019.8	361.0	658.8
1974	4,282.2	3,254.4	3,005.9	248.5	1,027.8	317.3	710.5
1975	4,411.7	3,346.7	3,068.0	278.7	1,065.0	312.3	752.7
1976	4,476.1	3,419.6	3,122.3	297.3	1,056.5	315.8	740.7
1977	4,694.7	3,618.6	3,195.1	423.5	1,076.1	307.8	768.3
1978	4,653.5	3,594.8	3,145.3	449.5	1,058.7	296.4	762.3

1/ Including dry weight of aquatic plants and some molluscs ex-shell. For adjusted figures see FAO derived data in Annex Tables A, B and C.

Marine Fishery

5. In 1977 the total marine fish yield of the whole country was also a record, about 3.62 million tons, but it dropped to 3.60 million tons in 1978. Out of total production from marine waters, fish species (including Cephalopods) are dominant, amounting to 70-80 percent of the total; next is shrimps and crabs, making up 10-15 percent, with shell fish (bi-valves and gastropods) and sea weeds each accounting for 5-10 percent (See Table 2).

Table 2: Marine Fish Yield by Species 1971-1978

....'000 tons...

Year	Total	Fish Species 1/	Shrimps & Crabs	Shell Fish 2/	Sea Weeds 3/
1971	2,560.0	1,977.5	306.7	138.3	137.5
1972	2,914.5	2,305.0	298.1	149.2	162.2
1973	2,911.3	2,254.1	382.3	137.1	137.8
1974	3,254.4	2,616.3	430.3	159.3	148.5
1975	3,346.7	2,552.9	404.1	225.3	164.4
1976	3,419.6	2,611.4	397.7	254.7	155.8
1977	3,618.6	2,652.9	445.5	288.8	231.4
1978	3,594.8	2,560.7	505.9	268.4	259.8

1/ Including jelly fish and squid
2/ Gastropods and bi-valves only
3/ Dry weight

6. Capture fisheries account for about 90 percent of the total yield of marine aquatic products and marine aquaculture about 10 percent. In recent years, the major marine fish species caught have been hairtail (Trichiurus haumela), large yellow croaker (Pseudosciaena crocea), mackerels (Scombridae, Carangidae), file fish (Navodon septentrionalis, N. modestus), Pacific herring (Clupea pallasi), Spanish mackerel (Scomberomorus niphonius), prawn (Penaeus orientalis) and paste shrimp (Acetes chinensis, A. japonicus). The annual yield of the major marine fish species taken by China is shown in Table 3.

(i) Marine Fishing

7. In 1978, 860,000 full-time fishermen were engaged in marine fisheries operating some 39,000 motorized marine fishing vessels with 2.73 million hp and a combined tonnage of 1.23 GRT of which small motorized fishing vessels (below 60 hp and 30 tons) were dominant. The fleet included, however, some 1,600 larger-sized fishing vessels (over 200 hp and 100 tons). The fishing methods include trawling, purse-seining, drift gill netting, set gill netting and line fishing, but trawling is the principal method used.

South China Sea

8. During the early post-liberation period, line-fishing and trawling were the main fishing methods used. Around the mid-1960s, purse-seining with lights was introduced. The fish species caught by purse-seine are round scad (Decapterus maruadsi), mackerel (Scomber japonicus), Pacific round herring (Etrumeus micropus), round herring (Dussumieira hasseltii) and sardine (Sardinella spp.). Because of the phototactic characteristic of the above-mentioned fish species, fish attracted by the light gather around to form a big fish school; purse-seine nets are then cast and the fishing efficiency is raised. Thus the marine fish yield of the South China Sea increased substantially from 400,000 tons in the 1960s to 700,000 tons in the 1970s.

9. At present the main fishing methods in the South China Sea are trawling and purse seining. Fishing operations are carried out in the 100 m deep contour line. The highest catch of marine fish taken by China in the South China Sea was 830,000 tons in 1977, but it fell to 600,000 tons in 1978 (see Table 4).

Table 4: Marine Fish Yield in the South China Sea 1970-1978

....'000 tons...

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978
Yield	533.2	595.6	662.2	528.7	707.7	779.7	777.3	831.9	605.9

East China Sea, Yellow Sea and Pohai Sea

10. The main fishing methods in these areas are trawling, purse-seining, drift gill netting, set gill netting and line-fishing. In the early post-liberation period, set gill netting, line-fishing and small purse-seining were the major

Table 3: Marine Fish: Yield of Major Species[1/] 1970-1978

....'000 tons...

Year	Hairtail	Large Yellow Croaker	Small Yellow Croaker	Mackerel	Pacific Herring	Spanish Mackerel	Chinese Herring	File Fish	Squids	Prawn	Shrimps	Jelly Fish
1970	391.8	158.7	30.4	173.1	2.2	26.6	9.0	...	56.6	14.4	92.7	50.6
1971	429.6	143.8	34.0	36.6	30.9	...	12.4	...	73.3	13.2	77.1	16.1
1972	495.5	149.3	20.5	78.3	181.9	32.8	11.1	...	47.8	11.9	90.1	16.6
1973	564.5	137.9	31.9	93.1	120.5	36.5	...	...	...	32.6	...	58.2
1974	577.3	197.2	...	113.5	71.7	39.2	...	...	...	39.9	...	22.1
1975	483.8	140.0	...	84.5	57.6	33.5	...	...	...	29.1	...	17.1
1976	433.6	123.7	...	79.0	55.3	28.2	...	...	35.8	10.0	115.1	5.1
1977	392.5	91.2	...	134.9	17.5	38.2	...	230.1	40.4	25.1	171.9	11.7
1978	387.2	93.8	...	282.3	21.8	34.5	...	310.4	62.0	38.4	195.5	3.6

1/ For scientific names and official FAO English names see Annex Table D.

fishing methods. With the motorization and enlargement of fishing vessels in the mid 1950s, trawling and purse-seining were developed. Because yields from the major demersal resources such as small yellow croaker (Pseudosciaena polyactis), hairtail (Trichiurus haumela), bastard halibut and other flat fish (Bothidae and Pleuronectidae) declined in the mid 1960s, drift gill netting for pelagic species was begun and purse-seining with light attraction was introduced in the early 1970s. The former method was used to catch Spanish mackerel (Scomberomorus niphonius), Chinese herring (Ilisha elongata) and mackerel, the latter for harvesting mackerel, round scad (Decapterus maruadsi), small sardine (Sardinella spp.) and Pacific herring (Clupea pallasi), etc. In the trawl fishery greater attention was paid to large yellow croaker (Pseudosciaena crocea), file fish (Navodon septentrionalis) and squids of which the main species are: Sepiella maindroni, Loligo japonica and L. beka. In the Pohai Sea set nets are used mainly to catch paste shrimps (Acetes chinensis) and small local species. The offshore set nets used in the waters off the province of Jiangsu and Zhenjiang are mainly to catch jelly fish (Rhopilema esculentum, R. hispidum, R. verrilli, R. rhopalophorum) and small local species.

11. The marine fish production from the East China Sea, Yellow Sea and Pohai Sea of 2.54 million tons in 1978 was a record. Landings in recent years are indicated in Table 5.

Table 5: Marine Fish Production in the East China Sea, Yellow Sea and Pohai Sea 1970-1978

....'000 tons...

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978
Yield	1,564.0	1,735.1	1,996.5	2,162.0	2,298.2	2,288.3	2,345.0	2,363.1	2,539.4

(ii) Marine Aquaculture

12. China was one of the earliest countries in the world to develop marine aquaculture. Before the Ming Dynasty (about 500-600 years ago), Chinese fishermen had already begun to culture oyster, laver, mother-of-pearl (Pteria martenssi), mullet (Mugil cephalus) and other species. They accumulated rich experience in aquaculture.

13. After the founding of New China, the Government gave powerful support to marine aquaculture, strengthening administrative leadership, organizing cooperative groups and providing technical and financial assistance. With the success of breeding the seeds of major farmed species and the introduction of culture techniques, rapid progress was made and the area under culture expanded. In 1978, the area utilized was 148,000 ha of which 65,000 ha were under intensive culture and 83,000 ha under extensive culture. Production from this area was 450,000 tons, amounting to 10 percent of the total yield of aquatic products or about 13 percent of the total marine fish yield.

14. Of the total marine aquaculture production, kelp (Laminaria japonica) makes up 55.9 percent, mussel (Mytilus edulis) 20 percent, oyster (Ostrea sp.), razor clam (Sinonovacula constricta), ark shell (Arca granosa), hard clam (Meretrix meretrix) and clam (Venerupis variegata), about 5 percent each with laver (Porphyra spp.) accounting for only 0.9 percent and marine farmed fish and shrimps (or prawns) less than 0.5 percent.

Kelp (Laminaria japonica)

15. Before liberation, kelp was mainly imported from other countries. In the early 1950s, Chinese fishery scientists and technicians made a study of the artificial culture of kelp. With the successful breeding of kelp seeds with natural light and the improvement of culture techniques of floating raft type, kelp culture advanced rapidly. From Lianing province in the North to Fujian province in the south, kelp culture has now been widely developed.

16. In the municipalities of the coastal provinces, kelp seed culture chambers have been set up, industrialized breeding of kelp seeds is practised and 6,000 million young kelp seeds for aquaculture can be supplied annually. In 1978 kelp production reached 250,000 tons (dried products). Kelp production in recent years is shown in Table 6.

Table 6: Kelp Production 1970-1978

								....'000 tons....	
Year	1970	1971	1972	1973	1974	1975	1976	1977	1978
Yield	88.3	134.0	158.7	133.7	144.7	159.9	150.4	222.2	251.4

Laver (Porphyra haitanesis, P. yezoensis)

17. In the early 1960s, Chinese fishery scientists, summing up the experience of the masses in laver culture on rocky shores, solved the technical problems in artificial laver spore culture and spore collection. By using the laver culture methods of semi-floating and fully-floating rafts, great progress was made. At present, the main laver culture areas are situated in the East China Sea and the southern Yellow Sea. The major species cultured beyond the south of the Yangtse River is Porphyra haitanensis the per mu (1/15 ha) yield of dried laver products being 150-200 kg. Beyond the north of the Yangtse River the main species cultured is Porphyra yezoensis of which the per mu yield of the dried products is around 100 kg.

Oyster and Razor Clam

18. Oysters and razor clams (Sinonovacula constricta) are two traditional species of marine aquaculture. Based on a better understanding of the laws of their spawning, oyster are fixed in deep sea water by the vertical hanging methods, while for the culture of the razor clam shores are ploughed and levelled so that the yield of both species is greatly increased. These two shell-fish species are mainly cultured off the coasts of Guangdong, Fujian, Zhenjiang and Taiwan provinces. At

present, annual oyster meat production (about 1/10 of weight with shell) is around 30,000 tons while that of the razor clam is some 40,000 tons.

Mussel

19. In 1978, experiments concerning mussel culture were carried out in Luda city, Liaoning province. Thanks to tackling the technical problems in mussel spore collection in the early 1970s good progress was made in the culture of these animals. In the north the mussel Mytilus edulis is mainly cultured, while in the south the green mussel Mytilus smaragdinus is the major species. In recent years, the annual farmed mussel production has been around 100,000 tons (see Table 7).

Table 7: Yield of Farmed Mussel 1977-1978

	....'000 tons...	
Year	1977	1978
Yield	102.1	96.2

Shrimps and Prawns

20. Prawn culture can be grouped into extensive culture in large water areas and intensive culture in small water areas. In the north, prawn (Penaeus orientalis) is the major species cultured. In the south, the cultured species are banana prawn (Penaeus merguiensis), red tailed prawn (P. penicillatus), Japanese tiger prawn or Kuruma prawn (P. japonicus) and jumbe tiger prawn (P. monodon). Mainly due to the shortage of feeds the area under prawn culture is small and farmed prawn production is only around 1,000 tons annually.

Fish Species

21. Marine fish culture is far less developed than freshwater fish culture. The area under marine fish culture is small and production lower than that in fresh waters. The major cultured species are mullet or haarder (Mugil so-iuy) and grey mullet (M. cephalus). The main practice is extensive culture by utilising natural fries in the sea bay.

Freshwater Fishery

22. China has a large area of fresh waters and the longest history of fish culture in the world. The total national freshwater fish production reached its highest point of about 1.23 million tons in 1959. In the following years it dropped to 800,000 tons. More recently production has recovered to more than one million tons. Within the total yield of freshwater aquatic products fish is dominant making up about 94-95 percent while shrimps, crabs and shell-fish account for about 2-4 percent and 3-4 percent respectively (see Table 8).

Table 8: Freshwater Fish Yield by Species 1971-1978

....'000 tons...

Year	Total	Fish Species	Shrimps & Crabs	Shell-Fish 1/
1971	935.9	879.7	21.4	34.8
1972	927.8	875.5	17.3	35.0
1973	1,019.8	971.2	22.1	26.5
1974	1,027.8	971.6	28.9	27.3
1975	1,065.0	1,002.9	38.6	23.6
1976	1,056.5	998.7	36.1	21.7
1977	1,076.1	1,019.5	32.3	24.3
1978	1,058.7	997.1	38.1	23.5

1/ Gastropods and bi-valves only

(i) Capture Fisheries

23. In the mid and late 1950s, the total annual freshwater fish catch was 500,000 to 600,000 tons, the highest being 680,000 tons in 1953. In the early 1960s, it began to drop and in 1978 it dropped to the low level of only 300,000 tons (for details see Table 1).

24. Over the last 20 years, the freshwater fish catch has dropped year by year. The main causes are: land reclamation, the construction of water gates and dykes on rivers and lakes, industrial pollution and over-fishing. All these have led to the deterioration of freshwater fish resources. Some years ago, because of the undue emphasis on the principle of "Taking the grain production as the key-link", land reclamation prevailed for a time. As a result, in the Yangtse valley alone, more than one million ha of land were reclaimed from the lakes. The water conservancy departments constructed water gates, dykes and other key water control projects on the lake inlets or outlets to the sea and on the principal rivers and their tributaries, thus preventing the migration of fish. Many anadromous fish, such as Hilsa herring (Hilsa reevesi), long tailed anchovy (Coilia mystus), catadromous species such as eel (Anguilla japonica), river crab (Eyiocheir sinensis) and semi-migratory species (such as black carp, grass carp, silver carp and bighead carp) lost the essential conditions for spawning with adverse effects on production.

(ii) Freshwater Aquaculture

25. China has a long history of freshwater fish culture and is one of the earliest countries in the world where pond fish farming has been practised. As far back as the 11th century B.C. in the late Yin Shang and early Zhou Dynasties, there were already written records of fish culture. About 2,400 years ago, a Chinese named Fan Li, based on the labouring people's experience in production, wrote a book on "Fish Breeding" which was among the earlier known documents on fish culture. The species raised at that time was common carp.

26. Since liberation, great achievements have been made in freshwater fish culture. In the early 1950s however, the areas under freshwater fish culture were limited to the Pearl Valley, in Guangdong province and the Yangtse valley, in Zhejiang and Jiangsu provinces. Fries of black carp, grass carp, silver carp and bighead carp came from the collection of natural young fish seeds in the Yangtse and Pearl rivers. In the circumstances, the production of farmed fish was governed by the abundance of fish seed in the natural rivers. Black carp, grass carp, silver carp and bighead carp are migratory species and every Spring they spawn in the rivers. The sexual glands of these species cultured in the ponds could, mainly for environmental reasons, only develop into the stage of massive egg yolk accumulation, but could not mature and spawn. In 1958 Chinese scientists taking into account the environmental as well as the physiological problems of spawning in captivity succeeded under artificial conditions of bringing silver carp to sexual maturity and inducing spawning. In 1960 and 1961, the success of artificial breeding of bighead carp, grass carp and black carp in succession changed the passive position of freshwater fish culture and greatly accelerated its development. Now freshwater aquaculture is practised all over the country. Production rose from 300,000 tons in the mid 1950s to 500,000 tons in the 1960s. In the 1970s it increased to nearly 800,000 tons (see Table 1). In 1978 the area under freshwater aquaculture was 2.72 million ha, of which the pond area made up 26.5 percent, reservoir 44.4 percent and others (enclosure culture in rivers and lakes) 9.6 percent (see Table 9).

Table 9: Area under Freshwater Aquaculture in 1978

hectare

Total	Fish Culture in Ponds	Fish Culture in Lakes	Fish Culture in Reservoirs	Other Culture in Enclosures
2,722,847	721,820	531,100	1,208,427	261,500
Proportion (per cent)	26.5	19.5	44.4	9.6

27. At present the major cultured freshwater fish species are: grass carp (Ctenopharyngodon idella), black carp (Mylopharyngodon piceus), silver carp (Hypophthalmichthys molitrix), bighead carp (Aristichthys nobilis), common carp (Cyprinus carpio), crucian carp (Carassius auratus), white amur bream (Parabramis pekinensis), Wuchang fish (Megalobrama amblycephala), mud carp (Cirrhina molitorella), tilapia (Tilapia mossambica, T. nilotica).

(a) Fish Culture in Ponds

28. With the improvement of fish culture techniques, rapid progress has been made in fish culture in ponds. Production from culture in ponds now accounts for a large proportion (60 percent) of the total freshwater fish yield. As conditions for fish farming vary from place to place, fish farming techniques have their own characteristics. Generally, culture methods in ponds can be classified into

intensive culture and extensive culture, monoculture and polyculture. The most developed areas in raising fish in ponds are mainly concentrated in the Taihu Lake and the Pearl River Delta. Now take Wuxi in the Taihu Lake area for example, we would like to describe the different characteristics of the fish culture in ponds.

29. Wuxi city is situated on the shore of the Taihu Lake. It has temperate climate, the annual average rainfall is 1,200 mm and it has a frost-free period of 220 days. The mean temperature is 2.5°C in January and 28.5°C in July. Generally the lowest temperature is -6°C and the highest 39°C. There are now 8,000 mu (533 ha) of pond area for intensive fish culture. The average yield in 1977 was 482 kg/mu (7,230 kg/ha). But the He Le People's Commune has 1,100 mu (73.3 ha) of pond area under intensive culture and the average yield is 611 kg/mu (9,165 kg/ha).

30. Generally the pond area of high-density polyculture is around 10 mu (0.7 ha), water depth 2.5-3 m. Grass carp, black carp, silver carp and bighead carp are the major species cultured. Their stocking rate makes up 85 percent of the total fish cultured. Polyculture is practised for varying-sized fish of the same species and harvesting and stocking are done in rotation. The proportion of different species in polyculture and the time for stocking in rotation are shown in Table 10. The stocking quantity is readjusted according to the growth situation of various species. Harvesting and stocking in rotation allows optimum production to be obtained from polyculture as over the whole harvesting/stocking cycle the optimum density can be maintained by fishing out the larger fish and allowing those left to grow as rapidly as possible. All this is to tap the productivity potential of ponds and guarantee higher yield. The major methods for harvesting and stocking in rotation are: harvest large-sized fish and retain small ones; harvest large-sized fish and add small ones.

Harvest Large Sized Fish and Retain Small Ones

31. Stock sufficient fish to maintain optimum density in the pond. Harvest those individuals which reach the commercial size while retaining small sized fish in the ponds for continued culture, e.g. grass carp with the body weight of over 1 kg can be harvested between June and September.

Harvest Large Sized Fish and Add Small Ones

32. During the middle stocking period, harvest the commercial sized individuals, e.g. harvest silver carps and bighead carps with the body weight of over 0.5 kg between June to September, then add 3-4 cm long fish fingerlings, which are raised until the end of the year. If they still have not reached commercial size, they are retained for continued culture as large sized fingerlings in the following year.

Fertilizing and Feeding

33. In fertilizing and feeding, mainly organic manure and natural foodstuffs are used, supplemented by commercial feeds. The annual intensive culture pond per mu is supplied with 7,000-10,000 kg of aquatic grasses (1 kg of land green grass is converted into 2 kg of aquatic grass), 5,000-7,500 kg of shell-fish, 20,000-25,000 kg of manure (liquid form), 100-150 kg of commercial feeds.

34. The principle of feeding and fertilizing is:

(a) In feeding and fertilizing, the principle of "even, good and sufficient" should be ensured. The concrete method is called "four fixes", i.e. fixed quality and quantity of feeds, fixed time and site of feeding.

(b) The feeding and fertilizing quantity of each day is determined by the water temperature, the dissolved oxygen in the ponds, the plankton amount in the water and feeding performance of the fish. The method of "four observations" is used, i.e. observation of the season, water colour, weather and feeding performance of the fish.

Table 10: Stocking Rate Per-mu of Adult Fish Pond in Wuxi

Fish Species	Stocking Month	Stocking Size	Fish Number/mu
Black Carp	Dec.- Jan.	1-2.5 jin 1/	35
		0.2-0.8 jin	50
		11-13 cm long	90
Grass Carp	Dec.- Jan.	1-1.7 jin	40
		0.2-0-8 jin	45
		11-13 cm long	90
Silver Carp	Dec.- Jan.	0.5-0.8 jin	120
		0.2-0.3 jin	230
	Late July	0.2-0.3 jin	150
Bighead Carp	Dec.- Jan.	0.5-0.8 jin	60
		0.2-0.3 jin	40
	Late July	3-4 cm long	100
Common Carp	Dec.- Jan.	10-13 cm	100
	Late June	3-4 cm	100
Wuchang Fish	Dec.- Jan.	13-15 cm	400
		5-7 cm	500
Crucian Carp	Dec.- Jan.	5-8 cm	600
Tilapia	Late April	5-7 cm	300
Total			3,050

1/ 1 jin = 0.5 kg

(b) Fish Culture in Lakes and Reservoirs

35. In most cases fish culture activity in lakes and reservoirs is confined to those having less than 6,000-7,000 ha of water areas. Mainly a proportionate amount of black carp, grass carp, silver carp and bighead carp fingerlings are stocked. The stocking rate of different species is determined by the kinds and quantity of natural food in the lakes and reservoirs. At present, due to the small size and small quantity of fish fingerlings stocked, most of the fish rely on natural food. As a result, the yield is not so high. In 1978 the average yield of fish cultured in lakes was 9 kg/mu (135 kg/ha), that of fish cultured in reservoirs 6 kg/mu (90 kg/ha) and that of fish cultured in enclosures in rivers and lake bays 20.5 kg/mu (307.5 kg/ha).

Processing and Utilization of Aquatic Products

36. China's processing industry is comparatively backward. Before liberation only a small number of chill rooms, cold stores and canneries were scattered in Shanghai and Tianjin. Dried and salted fish accounted for the greater proportion of processed fish products. After liberation, freezing plants, ice plants, fish meal factories and various processing establishments were set up in succession in all major cities and fishing ports. Now there are 163 cold stores for aquatic products in the whole country with a total capacity of 136,000 tons/time, providing 300,000 tons of frozen fish annually, while ice plant capacity is now 114,000 tons/time.

37. Aquatic products are mainly sold in fresh; frozen and salted form of which salted fish is the most important accounting for 30-50 percent of the total. Only a small quantity of fish is used to make fish meal and feeds. The annual production of canned fish amounts to some 6,000-7,000 tons while the annual output of minced fish products, such as fish cake and fish sausage, etc. is around 300-400 tons. State departments are responsible for unified purchasing and marketing of aquatic products.

Trade of Aquatic Products

38. China's aquatic products are mainly sold on home markets with a small amount for export. In recent years the annual export volume has been between 90,000 to 100,000 tons. The main products exported are fresh fish (cultured fish in ponds, such as grass carp, black carp, bighead carp, mud carp and Wuchang fish), frozen fish, frozen prawn and shell fish (hard clam, ark shell) and jelly fish. The export volume of aquatic products between 1970 to 1978 are shown in Table 11. Fresh fish, frozen fish are mainly exported to Hong Kong and Macao, and frozen prawn and jelly fish mainly to Japan and Southeast Asian countries.

Table 11: Exports of Aquatic Products 1970-1978

....'000 tons....

Year	Total	Fresh Fish	Frozen Fish	Frozen Prawn	Shell Fish	Jelly Fish	Other Aquatic Products
1970	92.8	24.3	23.9	7.1	...	3.2	34.3
1971	90.3	29.3	17.0	6.5	...	3.7	33.8
1972	96.4	29.9	15.7	3.8	...	3.8	43.2
1973	102.3	30.4	21.7	5.2	13.0	2.1	29.9
1974	107.4	29.0	18.3	11.7	16.1	3.4	28.9
1975	100.7	32.2	13.9	11.8	15.9	2.8	24.1
1976	93.4	29.7	12.3	5.8	22.5	1.5	21.6
1977	87.7	27.5	14.3	4.7	26.4	0.5	14.3
1978	92.0	28.4	14.3	11.0	22.1	1.0	15.2

Scientific Research

39. Before liberation, China had only one central experimental institute for fisheries which was established in August 1946 in Shanghai. Associated with the central institute were four substations set up in Yantai of Shandong province and in Jiangsu, Zhenjiang and Guangdong provinces. After liberation the Government attached great importance to the scientific research in fisheries and many technicians and personnel were trained, new scientific research institutes were established and existing stations strengthened. At present, the research institutes directly under the State General Administration of Aquatic Products are:

(1) For marine fisheries the Yellow Sea Fisheries Research Institute at Qingdao, East China Sea Fisheries Research Institute at Shanghai, and the South China Sea Fisheries Research Institute at Guangzhou.

(2) For inland fisheries the Heilongjiang Fisheries Research Institute at Haerbin, the Yangtse River Fisheries Research Institute at Shashi in Hubei province and the Pearl River Fisheries Research Institute at Guangzhou.

(3) The Research Institute of Fishery Machinery and Instruments at Shanghai.

40. Generally in the marine and inland water institutes, there are sections for fish resources, fishing techniques, processing of aquatic products, fishery machinery and instruments, etc. In the coastal provinces and in municipalities in important inland fishery areas, there are also research institutes directly under the leadership of provincial, municipal and prefectural governments.

PROSPECTS FOR FISHERY DEVELOPMENT

Fishery Resources in the East China Sea, Yellow Sea and Pohai Sea

41. The trawl fishery in the East China Sea, Yellow Sea and Pohai Sea harvests demersal resources at depths of up to 100 m. The main species harvested include small yellow croaker (Pseudosciaena polyactis), spotted maigre (Nibea albeflora) left and right eyed flounder (e.g. Paralichthys olivaceus and Pseudorhombus cinnamomeus), gurnards (Triglidae), cod (Gadus macrocephalus), red sea bream (Pagrosomus major). After the 1960s, the yield of these fish dropped and has continued at a low level. In 1957 for example, the yield of small yellow croaker was at a record of more than 160,000 tons since when it has dropped to no more than 20,000 to 30,000 tons in the 1970s. Now every Spring only a small number of small yellow croakers migrate into the spawning ground to spawn, and most of them are 1-year or 2-year old fish with very few of them over 3 years old.

42. There are two populations of hairtail fish in the marine areas under discussion, i.e. the Yellow Sea and Pohai Sea population and East China Sea population. In the 1950s and early 1960s the yield of hairtail from the Yellow Sea and Pohai Sea population was 50,000 to 60,000 tons. Afterwards, due to the increase in fishing intensity, the yield dropped sharply and is now less than 10,000 tons. The yield from the East China Sea population reached its high point of about 580,000 tons in 1974 (see Table 3). In spite of a continuous increase in fishing effort on this stock, the annual yield has dropped considerably; at the same time examination of the age composition of the population shows the younger fish to be dominant.

43. The yield of large yellow croaker in the East China Sea and Yellow Sea reached a record of about 200,000 tons in 1974, but in the last few years the yield of this species has also dropped considerably with a similar increase in the proportion of younger fish. The total production from this area has, however, been maintained and even increased by the development of the fishery for file fish the growth in the catches of which are given in Table 12.

Table 12: File Fish Yield of East China Sea 1974-1978

					....'000 tons...
Year	1974	1975	1976	1977	1978
Yield	40.4	80.1	192.7	148.3	193.3

44. File fish can be found in other parts of the East China Sea in addition to the central and southern areas and with better fish detection and increased fishing effort, catches can be increased.

45. Apart from file fish, the major demersal species in the whole of this area are fully exploited or over fished. As already noted in the 1950s and early 1960s the resources of some major fish species in this area such as small yellow croaker, left and right eyed flounder and gurnards, have deteriorated severely.

46. The pelagic species of this area are jack mackerel (Trachurus japonicus), mackerel (Scomber japonicus), round scad (Decapterus maruadsi) and small sardine (Sardinella sp.), etc. In the early 1950s, jack mackerel was the major fish species caught with purse seines in the northern part of the Yellow Sea with an annual yield around 4,000-5,000 tons. By the 1960s however the resource was seriously over exploited and catches of jack mackerel have since been negligible.

47. Mackerel is now the major fish species caught with purse-seines in the East China Sea and Yellow Sea. In the early 1950s, fishermen usually harvested the school of spawning fish and so the yield fluctuated greatly within the range 10,000 to 30,000 tons. In the 1970s, purse-seines with lights were introduced, expanding the area in which this species was exploited. Though the yield increased substantially, it has still not yet exceeded 80,000 tons. According to the age composition (2 and 3 year old fish predominate) and data concerning recruitment, the present mackerel resources in the East China Sea and Yellow Sea are still abundant. If the fishing intensity is increased and the area for fishing operation expanded, especially to include the schools of wintering mackerel, the catch possibly can be increased.

48. Other pelagic fish include butterfish (Stromateoides argenteus) and harvestfish (Stromateoides nozawae). In recent years, these two species have been caught with big-mesh drift nets in waters offshore of Jiangsu province and are also caught incidentally in trawl fisheries, the annual yield being around 2,000 to 3,000 tons. At this rate of exploitation the resources seem stabilized at a reasonably high level.

49. Spanish mackerel (Scomberomorus niphonius) and Chinese herring (Ilisha elongata) are the major species caught with drift nets in this area. In the mid 1960s, the yield of Chinese herring reached 30,000 tons, but has fallen to 10,000 tons in recent years and young fish predominate in the catches. This species is fully or even over exploited and as a result the resource is at a low level.

50. The highest yield of Spanish mackerel, some 38,000 tons, was achieved in 1977. The relationship between catch per unit effort and fishing effort for this species is shown in Table 13 and Fig.1

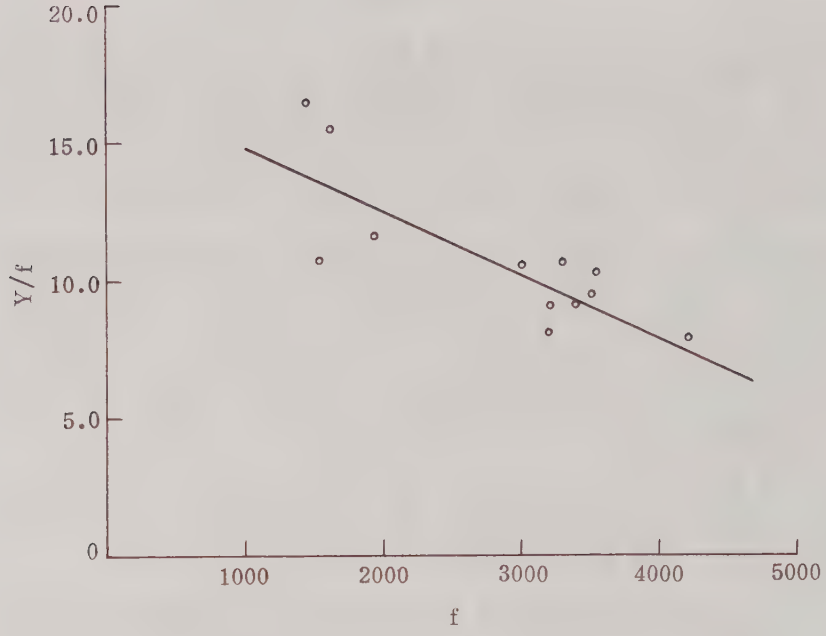


Fig.1. Spanish mackerel in East China Sea, Yellow Sea and Pohai Sea
Relation between Catch per Unit Effort and Fishing Effort

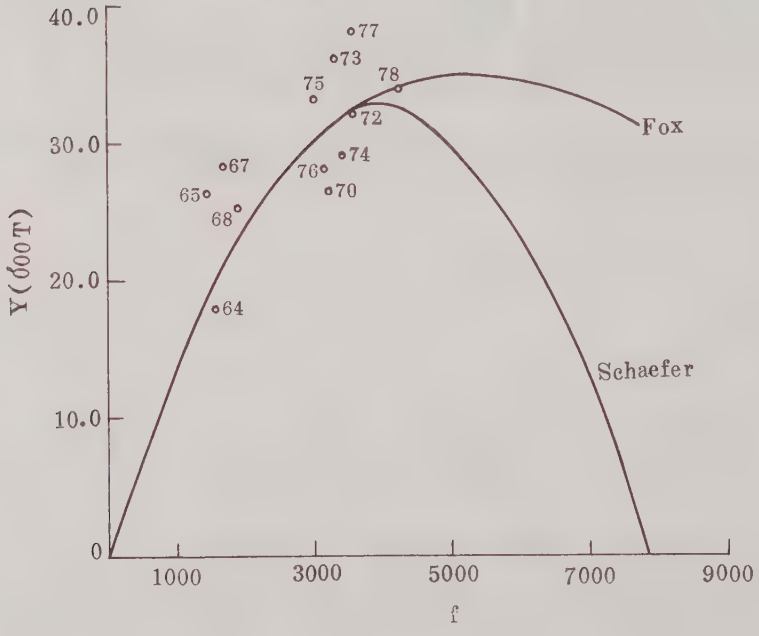


Fig.2. Spanish mackerel in East China Sea, Yellow Sea and Pohai Sea
Relation between Fishing Effort and Total Catch

Table 13: Spanish Mackerel: Catch and Effort in East China Sea, Yellow Sea and Pohai Sea

Year	Catch Tons Y	Fishing Effort 100 units of drift net f	Catch per Unit Effort Y/f
1964	17,989	1,550	11.6
1965	26,554	1,483	17.9
1967	18,046	1,611	11.2
1968	25,820	1,956	13.2
1970	26,604	3,244	8.2
1972	32,822	3,529	9.3
1973	36,510	3,289	11.1
1974	29,183	3,393	8.6
1975	33,537	3,049	11.0
1976	28,206	3,280	8.6
1977	38,223	3,572	10.7
1978	34,530	4,263	8.3

51. Both the Schaefer model and Fox model are used to calculate the maximum sustained yield (MSY) and optimum fishing effort (f_o). (See Fig.2).

Schaefer Model:

$$Y = 17.0225\ f - 2.1856 \times 10^{-3} f^2$$

MSY = 33,144 (tons) $\qquad f_o$ = 3,894 (100 webbings)

Fox Model:

$$Y = 18.0082\ f\ e^{-1.8861 \times 10^{-4} f}$$

MSY = 35,125 (tons) $\qquad f_o$ = 5,302 (100 webbings)

52. The actual state of production in recent years shows that the total yield of Spanish mackerel in the East China Sea, Yellow Sea and Pohai Sea has reached the maximum sustained yield (MSY) or slightly exceeded it (see Fig.2). This indicates that Spanish mackerel resources have been fully exploited and therefore it is not advisable to increase fishing effort.

Fishery Resources in the South China Sea

53. The species composition of the trawl catch in the northern part of the South China Sea varies from season to season with more species in Summer (about 400), and less in Autumn (about 330); in other seasons there are 345-370 species. Fish of the Nemipteridae family make up over 10 percent; Mullidae, Balistidae, Synodidae families 5-10 percent; Sciaenidae, Cephalopodae and Lutianidae families 4-5 percent; Priancanthidae, Sparidae, Muraenesocidae families about 2-4 percent and Tetrodontidae, Triglidae families about 1-2 percent.

54. As for the demersal resources within the 100-metre contour, only preliminary estimates can be made due to the lack of basic statistical data, but Mr. Fei Hongnian of the South China Sea Fisheries Research Institute has calculated the maximum sustained yield to be of the order of 335,000 tons. The variation of demersal fish yield in the past few years and the dominant number of younger fish in the age composition of the total catch show that the demersal fish resources with 100-metre contour are in this area already over-exploited.

55. The major pelagic fish species in the South China Sea caught with the inshore purse-seines, such as round scad (Decapterus maruadsi), mackerel, round herring (Dussumieria hasseltii), Pacific round herring (Etrumeus micropus) are now fully exploited.

Fisheries Development Policy

56. In February 1979, the Government held the National Conference on Fisheries. Summing up the experiences and lessons of fishery development and in the light of existing problems of fishery production, it adopted a policy for production containing the following elements: "Energetically Protect the Resources, Actively Develop Marine and Freshwater Aquaculture, Adjust Offshore Fishing Operations, Open up Off-shore Fishing Grounds, Adopt the Advanced Techniques, Strengthen Scientific Research, Improve the Quality of Aquatic Products, Enliven the Urban and Rural Markets".

(i) Intensify the Conservation of Fishery Resources and Establish a Better Fishery Management System

57. There was already a certain kind of fishery management system as far back as the Western Zhou Dynasty (1066-771 B.C.). The book "Zhou Rites" made mention of fish species caught and how fish was used as royal food, sacrificial offering, and a gift to guests. A special official post was assigned to supervise the supply of fish. At that time, Spring, Autumn and Winter were fishing seasons but not Summer when fish and shrimps would spawn. This was the earliest regulation for closed fishing period in China.

58. In the Spring and Autumn Period, in his book, Mencius said: "Do not cast too many nets in a small pond, for fish and turtle should not be overfished." Mencius was the earliest to put forward the idea of controlling fishing effort and preventing over-fishing.

59. After liberation, on 25 August 1950, in the Order No. 546, the East China Military and Civil Affairs Committee proclaimed "Regulation on the Bottom Trolling Fishery with Motorized Vessels in East China (Tentative)". In order to protect fish breeding and avoid disputes, a closed fishing zone was delimited. Bottom trolling vessels equipped with propellers were not allowed to enter the closed fishing zone for fishing operations.

60. In 1955 "Order of the State Council of the People's Republic of China Concerning the Closed Fishing Zone for Motorized Trawlers in Pohai Sea, Yellow Sea and East China Sea" was issued. In July 1957, Additional Regulations to the above order were made public. The main fish spawning grounds in principal rivers like the Yangtse were delimited and powers given to local authorities to adopt concrete measures so as to carry out the "Regulation" according to specific local

conditions. Fishing was banned periodically to protect fish brooders so that sufficient numbers of brooders could swim into the spawning grounds to spawn. In 1957 on the basis of summing up the experience in resources conservation in different places, the Ministry of Fisheries formulated "Regulation on Breeding and Conservation of Fishery Resources (Draft)". The regulation - stipulated the protected species and permitted methods of harvesting, the mesh size of various fishing gears, closed fishing zones and closed fishing seasons. Fishing gears harmful to young fish were banned and fishing methods damaging to the resources were forbidden. It also mentioned the protection of the environment and included rewards and punishments for the implementation of the regulations.

61. Based on the law of quantitative variation of prawn resources, in 1962 the former Ministry of Fisheries specially laid down "Measures of Breeding and Conservation of Prawn Resources (Tentative)", which stipulated the closed fishing zone and closed fishing season. In Spring the trawlers were banned from entering the western waters beyond the east longitude 122°30' to catch prawns, so that the spawning prawn brooders were conserved and harm caused by men to the young prawns was reduced.

62. All the above-mentioned measures for fishery management played an active role in the conservation of fishery resources and the maintenance of orderly fishing operations. But in the last ten years, because the work of conserving fishery resources was disturbed and slackened, in some places severe over-fishing occurred and industrial pollution and water conservancy works on farm-land adversely affected the aquatic environment and caused serious damage to fishery resources in the off-shore and inland waters. In view of these facts, in April 1979 "Regulation on Breeding and Conservation of Fishery Resources" was made public again by the Government. In accordance with the stipulations of the "Regulation", provinces, municipalities and autonomous regions adjacent to fishery resources laid down detailed regulations for its implementation. In waters where fish and shrimps of significant economic value were harvested and especially where spawning and young fish concentrated and the resources were deteriorating, closed seasons were fixed and closed areas established where motorized trawlers are not allowed to fish. Detailed regulations concerning conservation were drawn up including size limits, control of fishing operations, vessel numbers and catch quotas. Set nets and traps which do harm to young fish and shrimps were strictly prohibited. The number of off-shore fishing fishing vessels was restricted, trawling operations reduced, purse-seining, drift netting and line-fishing operations were developed sometimes using converted small horse power trawlers, which were also used for coastal aqua-culture.

63. Administrative organs for fisheries at various levels have been set up and strengthened. Under the State General Administration of Aquatic Products, there is the fisheries administration department, but the provincial, municipal bureaux of aquatic products have their own fishery administration divisions. Both the Central Government through the State General Administration of Aquatic Products and the Provincial Governments, operate fishery protection services. In general vessels responsible to the State General Administration operate off-shore on a sea area basis, e.g. South China Sea, East China Sea, etc., while the vessels under provincial jurisdiction are responsible for the enforcement of regulations in in-shore waters. In accordance with "Regulation on Breeding and

Conservation of Fishery Resources", water conservancy and industrial departments are requested to abide strictly by the stipulations concerning the conservation of resources and prevention of pollution.

64. In September 1979, the 11th Session of the Standing Committee of the 5th National People's Congress adopted in principle "Law on the Protection of Environment of the People's Republic of China (Tentative)". It was formulated on the basis of summing up the experiences of environmental protection in China and drawing on the useful experience in legislation on environmental protection in foreign countries. It laid down in a systematic and comprehensive manner the principles of environmental protection in China, the objectives of legislation in this field and the administrative, organizational research and other requirements to attain these objectives.

65. On 1 December 1979, the Leading Group for Environmental Protection under the State Council, the State Capital Construction Commission, the State Economic Commission and the State General Administration of Aquatic Products issued "Standard of Fishery Water Quality". This was drawn up according to the State's stipulations for the protection of the environment and natural resources against pollution and other forms of environmental degradation so as to ensure the quality of fishery waters to meet the needs of normal growth and breeding of fish, shrimps, shellfish and sea weeds in order to maintain the quality of aquatic products. People's health must be guaranteed, fishery resources conserved and the development of fishery production promoted.

(ii) Fully Utilize the Water Area to Develop Aquaculture

66. Because of the changing ocean system in recent years, more and more countries attach importance to the potential prospects for aquaculture. Since liberation, China's aquaculture has made great progress. The freshwater area under aquaculture in 1978 was 10 times larger than the early post-liberation period, but the natural conditions suitable for aquaculture are far from fully utilized. According to the incomplete statistics, the off-shore beach and shore suitable for fish and shrimp farming is of the order of 130,000 ha (about 2 million mu) of which only 5 percent is at present under aquaculture. Of the freshwater area suitable for aquaculture only 60 percent has been utilized, so there is still great potential for further developments.

67. For freshwater aquaculture, at present only some ponds under intensive culture give high yields. In other places, due to insufficient feeds, fertilizers and fish seeds, fish cultured extensively in ponds, reservoirs and lakes have to live on the natural foods with consequently much lower yields per unit area.

68. In order to speed up the development of marine and freshwater aquaculture, the key problems such as feeds and fertilizers should be solved properly. Work has to be done to cultivate better fish seeds, to establish on a commercial basis a network of stations for the production of fry and the rearing of fish for sale, to develop fish culture in the suburbs of cities and fish farming by the communes and production brigades and to make great efforts to raise the production in the lakes and reservoirs. Attention must be paid to strengthening research including studies of basic theory and to improve aquaculture techniques so as to speed up the mechanization of aquaculture.

(iii) Do a Good Job in Preserving and Processing of Aquatic Products and Improve the Quality of Fish Products

69. At present the quality of aquatic products is poor and salted fish products make up a large proportion. This is because there are no vessels with refrigeration facilities on board and shore based ice-making capacity is inadequate. Thus most of the vessels of the collective fishermen do not carry ice.

69. In order to change this situation, it is essential to solve the problem of preservation on board to establish a cold chain to increase the production of refrigeration equipment, build up integrated processing bases in selected countries and communes and try the establishment of enterprises in which catching, processing and marketing are fully integrated. The policy of fixing the price according to the quality has also to be carried out. Distribution of aquatic products should be arranged in accordance with the economic areas and historical habits. Communes and production brigades in the city suburbs should establish contact directly with the retailers and supply them with fresh and live aquatic products.

ORGANIZATIONAL STRUCTURE

70. The leading body of fishery administration of the whole country is the State General Administration of Aquatic Products. It has, within it the following subdivisions: the Marine Fishery Department, Freshwater Fishery Department, Department of Science and Education, Department of Planning and Finance, Department of Capital Construction, Material Department, Department of Fishery Machinery, Department of Supply and Marketing, Department of Fishery Administration and Department of Foreign Affairs.

71. Except Taiwan province and Xizan (Tibet) Autonomous Region, the other 28 provinces, municipalities, autonomous regions in the country all have set up leading bodies of fishery administration. The provinces, municipalities and autonomous regions which have set up the Bureaux of Aquatic Products are: Guangdong, Guangxi, Fujian, Zhejiang, Shanghai, Jiangsu, Shandong, Hebei, Tianjin, Lianning, Beijing, Hubei, Jiangxi, Anhui, Xinjiang, Qinghai and Heilongjiang. In the other provinces, municipalities and autonomous regions there are administrative bodies for fisheries at division level either under Bureaux of Agriculture and Forestry, or under Bureaux of Water Conservancy or Commercial Bureaux. The Bureaux of Aquatic Products or the appropriate division of the various provinces, municipalities and autonomous regions are affiliated to their localities, but the State General Administration of Aquatic Products is responsible for professional leadership.

TABLE A - CHINA: ANNUAL OUTPUT OF AQUATIC ANIMAL AND PLANT PRODUCTS IN FRESHWATER AND MARINE FISHERIES

...Metric tons....

Categories	1970	1971	1972	1973	1974	1975	1976	1977	1978
AGGREGATES WITH KELP AND OTHER SEAWEEDS ON A WET-WEIGHT BASIS									
NATIONAL TOTAL	3,625,995	4,183,239	4,653,556	4,619,903	5,024,631	5,233,795	5,255,232	5,851,662	5,952,677
Freshwater fisheries	903,737	935,890	927,802	1,019,792	1,027,799	1,065,044	1,056,516	1,076,065	1,058,695
Catching	321,717	315,927	306,682	361,032	317,253	312,369	315,827	307,781	296,441
Aquaculture	582,020	619,963	621,120	658,760	710,546	752,675	740,689	768,284	762,254
Marine fisheries	2,722,258	3,247,349	3,725,754	3,600,111	3,996,832	4,168,751	4,198,716	4,775,597	4,893,982
Catching	2,097,147	2,348,138	2,676,203	2,710,838	3,024,787	3,090,347	3,149,256	3,241,015	3,187,384
Aquaculture	625,111	899,211	1,049,551	889,273	972,045	1,078,404	1,049,460	1,534,582	1,706,598
AGGREGATES WITH KELP AND OTHER SEAWEEDS ON A DRY-WEIGHT BASIS									
NATIONAL TOTAL	3,184,525	3,495,904	3,842,326	3,931,054	4,282,181	4,411,760	4,476,127	4,694,652	4,653,482
Freshwater fisheries	903,737	935,890	927,802	1,019,792	1,027,799	1,065,044	1,056,516	1,076,065	1,058,695
Catching	321,717	315,927	306,682	361,032	317,253	312,369	315,827	307,781	296,441
Aquaculture	582,020	619,963	621,120	658,760	710,546	752,675	740,689	768,284	762,254
Marine fisheries	2,280,788	2,560,014	2,914,524	2,911,262	3,254,382	3,346,716	3,419,611	3,618,587	3,594,787
Catching	2,097,147	2,330,653	2,658,658	2,690,684	3,005,872	3,068,017	3,122,281	3,195,060	3,145,249
Aquaculture	183,641	229,361	255,866	220,578	248,510	278,699	297,330	423,527	449,538

TABLE B - CHINA: ANNUAL OUTPUT OF AQUATIC ANIMAL AND PLANT PRODUCTS THROUGH CATCHING AND AQUACULTURE

...Metric tons....

Categories	1970	1971	1972	1973	1974	1975	1976	1977	1978
AGGREGATES WITH KELP AND OTHER SEAWEEDS ON A WET-WEIGHT BASIS									
NATIONAL TOTAL	3,625,995	4,183,239	4,653,556	4,619,903	5,024,631	5,233,795	5,255,232	5,851,662	5,952,677
Catching	2,418,864	2,664,065	2,982,885	3,071,870	3,342,040	3,402,716	3,465,083	3,548,796	3,483,825
Freshwater fisheries	321,717	315,927	306,682	361,032	317,253	312,369	315,827	307,781	296,441
Marine fisheries	2,097,147	2,348,138	2,676,203	2,710,838	3,024,787	3,090,347	3,149,256	3,241,015	3,187,384
Aquaculture	1,207,131	1,519,174	1,670,671	1,548,033	1,682,591	1,831,079	1,790,149	2,302,866	2,468,852
Freshwater fisheries	582,020	619,963	621,120	658,760	710,546	752,675	740,689	768,284	762,254
Marine fisheries	625,111	899,211	1,049,551	889,273	972,045	1,078,404	1,049,460	1,534,582	1,706,598
AGGREGATES WITH KELP AND OTHER SEAWEEDS ON A DRY-WEIGHT BASIS									
NATIONAL TOTAL	3,184,525	3,495,904	3,842,326	3,931,054	4,282,181	4,411,760	4,476,127	4,694,652	4,653,482
Catching	2,418,864	2,646,580	2,965,340	3,051,716	3,323,125	3,380,386	3,438,108	3,502,841	3,441,690
Freshwater fisheries	321,717	315,927	306,682	361,032	317,253	312,369	315,827	307,781	296,441
Marine fisheries	2,097,147	2,330,653	2,658,658	2,690,684	3,005,872	3,068,017	3,122,281	3,195,060	3,145,249
Aquaculture	765,661	849,324	876,986	879,338	959,056	1,031,374	1,038,019	1,191,811	1,211,792
Freshwater fisheries	582,020	619,963	621,120	658,760	710,546	752,675	740,689	768,284	762,254
Marine fisheries	183,641	229,361	255,866	220,578	248,510	278,699	297,330	423,527	449,538

TABLE C - CHINA: ANNUAL OUTPUT OF AQUATIC ANIMAL AND PLANT PRODUCTS BY SPECIES AND FISHERY

...Metric tons....

Categories	1970	1971	1972	1973	1974	1975	1976	1977	1978
NATIONAL TOTAL: ALL SPECIES INCLUDING SEA-WEEDS ON A WET-WEIGHT BASIS	3,625,995	4,183,239	4,653,556	4,619,903	5,024,631	5,233,795	5,255,232	5,851,662	5,952,677
FRESHWATER FISHES, CRUSTACEANS, MOLLUSCS, ETC	903,737	935,890	927,802	1,019,792	1,027,799	1,065,044	1,056,516	1,076,065	1,058,695
Catching and Aquaculture	903,737	935,890	927,802	1,019,792	1,027,799	1,065,044	1,056,516	1,076,065	1,058,695
Freshwater fishes	...	879,741	875,523	971,188	971,594	1,002,872	998,683	1,019,474	997,049
Freshwater shrimps, crabs	...	21,390	17,324	22,149	28,882	38,594	36,092	32,271	38,101
Freshwater shellfish	...	34,759	34,955	26,455	27,323	23,578	21,741	24,320	23,545
MARINE FISHES, CRUSTACEANS, MOLLUSCS, ETC.	2,192,494	2,422,547	2,752,278	2,773,233	3,105,892	3,182,309	3,263,790	3,387,185	3,334,948
Catching	2,097,147	2,327,156	2,655,149	2,686,394	3,002,089	3,063,551	3,116,886	3,185,869	3,136,822
Elongate ilisha	9,003	12,387	11,114	...	...	...	...	...	...
Greater yellow croaker	158,694	143,819	149,255	137,868	197,179	140,016	123,670	91,229	93,821
Lesser yellow croaker	30,392	33,990	20,531	31,865	...	...	...	...	...
Filefishes	...	...	...	...	...	...	...	230,142	310,351
Pacific herring	2,240	30,905	181,875	120,548	71,677	57,657	55,321	17,539	21,806
Japanese Spanish mackerel	26,604	...	32,822	36,510	39,183	33,537	28,206	38,223	34,530
Large-head hairtail	391,825	429,616	495,452	564,455	577,335	483,831	433,619	392,515	387,164
Chub mackerel	173,055	36,561	78,324	93,089	113,547	84,487	78,965	134,852	282,262
Marine species nei	809,645a/	1,154,973a/	1,220,050a/	1,167,208a/	1,445,660a/	1,680,508a/	1,791,229a/	1,594,244a/	1,268,998a/
Marine crabs nei	200,000b/	216,365	196,020	349,717	390,358	374,937	272,620	248,565	272,024
Fleshy prawn	14,398	13,231	11,941	32,558	39,921	29,145	9,978	25,080	38,381
Akiami paste shrimp	92,748	77,127	90,148	...	...	...	115,076	171,858	195,457
Clams nei ("Shellfish")	81,383	88,835	103,170	94,383	105,161	162,324	167,319	189,578	166,429
Squids nei	56,570	73,292	47,811	...	...	...	35,752	40,391	61,955
Jellyfishes	50,590	16,055	16,636	58,193	22,068	17,109	5,131	11,653	3,644

Continued.....

TABLE C - CHINA: ANNUAL OUTPUT OF AQUATIC ANIMAL AND PLANT PRODUCTS BY SPECIES AND FISHERY (concluded)

....Metric tons....

Categories	1970	1971	1972	1973	1974	1975	1976	1977	1978
Aquaculture	95,347	95,391	97,129	86,839	103,803	118,758	146,904	201,316	198,126
Sea mussels nei	36,730	45,870	51,170c/	44,120c/	49,700c/	55,740c/	59,470c/	102,075	96,190
Clams nei ("Shellfish")	58,617	49,521	45,959	42,719	54,103	63,018	87,434	99,241	101,936
SEAWEEDS d/	529,764	824,802	973,476	826,878	890,940	986,442	934,926	1,388,412	1,559,034
Catching	...	20,982	21,054	24,444	22,698	26,796	32,370	55,146	50,562
Red seaweeds ("Laver")	... ...	20,982 *(3,497)*	21,054 *(3,509)*	24,444 *(4,074)*	22,698 *(3,783)*	26,796 *(4,466)*	32,370 *(5,395)*	55,146 *(9,191)*	50,562 *(8,427)*
Aquaculture	529,764	803,820	952,422	802,434	868,242	959,646	902,556	1,333,266	1,508,472
Brown seaweeds ("Kelp")	529,764 *(88,294)*	803,820 *(133,970)*	952,422 *(158,737)*	802,434 *(133,739)*	868,242 *(144,707)*	959,646 *(159,941)*	902,556 *(150,426)*	1,333,266 *(222,211)*	1,508,472 *(251,412)*

a/ Balance of "Marine catching" total minus the data for the other species listed under this heading.
b/ FAO estimate.
c/ FAO estimate based on 20% of the total marine aquaculture yield.
d/ Quantities on a wet-weight basis; quantities on a dry-weight basis shown in italics, in parentheses.

TABLE D - CHINA: REFERENCE LIST OF PRINCIPAL INLAND AND MARINE SPECIES

Terminology used in FAO					Terminology used in China	
3-alpha identifiers	ISSCAAP group number	Taxonomic code	Scientific name	English name	English name	Scientific name
FCP	11	1,40(02)002,01	*Cyprinus carpio*	Common carp	Common carp	*Cyprinus carpio*
CGO	11	1,40(02)016,02	*Carassius auratus*	Chinese goldfish	Crucian carp	*Carassius auratus*
MUC	11	1,40(02)025,02	*Cirrhinus mulitorella*	Mud carp	Mud carp	*Cirrhina mulitorella*
BIC	11	1,40(02)027,01	*Aristichthys nobilis*	Bighead carp	Bighead carp	*Aristichthys nobilis*
FCG	11	1,40(02)035,01	*Ctenopharyngodon idella*	Grass carp	Grass carp	*Ctenopharyngodon idella*
SVC	11	1,40(02)043,01	*Hypophthalmichthys molitrix*	Silver carp	Silver carp	*Hypophthalmichthys molitrix*
WAB	11	1,40(02)076,01	*Parabramis pekinensis*	White amur bream	White amur bream	*Parabramis pekinensis*
BKC	11	1,40(02)144,01	*Mylopharyngodon piceus*	Black carp	Black carp	*Mylopharyngodon piceus*
WUB	11	1,40(02)151,01	*Megalobrama amblycephala*	Wuchang bream	Wuchang fish	*Megalobrama amblycephala*
ELJ	22	1,43(02)002,04	*Anguilla japonica*	Japanese eel	Eel	*Anguilla japonica*
REE	24	1,21(05)034,03	*Hilsa reevesi*	Reeves' shad	Hilsa herring	*Hilsa reevesi*
EIL	24	1,21(05)035,03	*Ilisha elongata*	* Elongate ilisha	Chinese herring	*Ilisha elongata*
BAH	31	1,83(02)046,01	*Paralichthys oilvaceus*	Bastard halibut	Flounder	*Paralichthys olivaceus*
WFL	31	1,83(02)050,01	*Pseudopleuronectes herzensteini*	Yellow striped flounder	Plaice	*Cleisthenes herzensteini*
CIF	31	1,83(01)051,05	*Pseudorhombus cinnamoneus*	Cinnamon flounder	Right eye flounder	*Pseudorhombus cinnamomeus*
PCO	32	1,48(04)002,11	*Gadus macrocephalus*	Pacific cod	Cod	*Gadus macrocephalus*
GRY	33	1,70(37)073,05	*Pseudosciaena crocea*	* Greater yellow croaker	Large yellow croaker	*Pseudosciaena crocea*
LSY	33	1,70(37)073,09	*Pseudosciaena polyactis*	* Lesser yellow croaker	Small yellow croaker	*Pseudosciaena polyactis*
YED	33	1,70(37)298,01	*Nibea albiflora*	Yellow drum	Spotted meagre	*Nibea albiflora*
SIS	33	1,70(39)121,08	*Chrysophrys major*	Silver seabream	Red sea bream	*Pagrosomus major*
ROX	33	1,78(02)XXX,XX	Triglidae	Searobins	Gurnards	Triglidae
FLF	33	1,89(04)004,XX	*Cantherines (=Navodon)* spp.	* Filefishes	Filefish	*Navodon septentrionalis* *Navodon modestus*
MUF	34	1,65(01)001,02	*Mugil cephalus*	Striped mullet	Mullet	*Mugil cephalus*
SOY	34	1,65(01)012,01	*Liza haematochila*	So-iny mullet	Haarder	*Mugil so-iny*
JJM	34	1,70(23)004,03	*Trachurus japonicus*	Japanese jack mackerel	Jack mackerel	*Trachurus japonicus*
RSA	34	1,70(23)043,07	*Decapterus maruadsi*	Round scad	Round scad	*Decapterus maruadsi*
SIP	34	1,76(03)009,01	*Pampus argenteus*	Silver pomfret	Butterfish	*Stromateoides argenteus*
CPO	34	1,76(03)009,02	*Pampus chinensis*	Chinese pomfret	Harvestfish	*Stromateoides nozawae*

Continued.....

TABLE D - CHINA: REFERENCE LIST OF PRINCIPAL INLAND AND MARINE SPECIES (concluded)

Terminology used in FAO					Terminology used in China	
3-alpha identifiers	ISSCAAP group number	Taxonomic code	Scientific name	English name	English name	Scientific name
HEP	35	1,21(05)001,07	*Clupea pallasi*	★ Pacific herring	Pacific herring	*Clupea pallasi*
SIX	35	1,21(05)012,XX	*Sardinella* spp.	Sardinellas nei	Sardines	*Sardinella* spp.
RAS	35	1,21(05)029,01	*Dussumieria acuta*	Rainbow sardine	Round herring	*Dussumieria hasseltii*
RRH	35	1,21(05)031,01	*Etrumeus teres*	Red-eye round herring	Pacific round herring	*Etrumeus micropus*
RAA	35	1,21(06)026,04	*Coilia mystus*	Rattail anchovy	Long tailed anchovy	*Coilia mystus*
NPH	36	1,75(01)015,12	*Scomberomorus niphonius*	★ Japanese Spanish mackerel	Spanish mackerel	*Scomberomorus niphonius*
LHT	37	1,74(04)003,02	*Trichiurus lepturus*	★ Largehead hairtail	Hairtail	*Trichiurus haumela*
MAS	37	1,75(01)002,01	*Scomber japonicus*	★ Chub mackerel	Mackerel	*Pneumatophorus japonicus*
CRA	42	2,99(XX)XXX,XX	...	★ Marine crabs nei	Crabs	...
PBA	45	2,28(01)001,03	*Penaeus merguiensis*	Banana prawn	Banana prawn	*Penaeus merguiensis*
KUP	45	2,28(01)001,09	*Penaeus japonicus*	Kuruma prawn	Kuruma prawn	*Penaeus japonicus*
GIT	45	2,28(01)001,12	*Penaeus monodon*	Giant tiger prawn	Jumbe tiger prawn	*Penaeus monodon*
FLP	45	2,28(01)001,16	*Penaeus chinensis*	★ Fleshy prawn	Prawn	*Penaeus chinensis*
REP	45	2,28(01)001,30	*Penaeus penicillatus*	Redtail prawn	Red tailed prawn	*Penaeus penicillatus*
AKS	45	2,28(07)009,03	*Acetes japonicus*	★ Akiami paste shrimp	Shrimps	*Acetes japonicus* *Acetes chinensis*
OYX	53	3,16(07)002,XX	*Ostrea* spp.	Flat oysters nei	Oysters	*Ostrea* spp.
MUS	54	3,16(10)001,05	*Mytilus edulis*	★ Blue mussel	Mussels	*Mytilus edulis*
MUG	54	3,16(10)001,10	*Mytilus smaragdinus*	★ Green mussel	Mussels	*Mytilus smaragdinus*
BLC	56	3,16(04)071,01	*Anadara granosa*	Blood cockle	Ark shell	*Arca granosa*
HCJ	56	3,17(11)017,01	*Meretrix lusoria*	Japanese hard clam	Hard clam	*Meretrix meretrix*
CLJ	56	3,17(11)018,01	*Venerupis japonica*	Japanese (=Manila) clam	Clam	*Venerupis variegata*
CLX	56	3,99(XX)XXX,XX	Prionodesmacea, Teleodesmacea	★ Clams nei	Shellfish	*Arca* spp.
SQU	57	3,99(XX)XXX,XX	Loliginidae, Ommastrephidae	★ Squids nei	Squids	*Sepiella maindroni*, *Loligo japonica*, *Loligo beka*
JEL	76	6,17(41)007,XX	*Rhopilema* spp.	★ Jellyfishes	Jellyfish	*Rhopilema esculentum*, *Rhopilema hispidum*, *Rhopilema verrilli*, *Rhopilema rhopalophorum*
SWB	91	7,71(XX)XXX,XX	Phaeophyceae	★ Brown seaweeds	Kelp	*Laminaria japonica*
SWR	92	7,81(XX)XXX,XX	Rhodophyceae	★ Red seaweeds	Laver	*Porphyra* spp.

★ These starred items reflect the species used as categories in Table C.

CHINA
and Adjacent Seas
U. S. S. R.
Heilongjiang
HEILONGJIANG
HARBIN
JILIN
CHANGCHUN
MONGOLIA
AFGHANISTAN
URUMQI
LIAONING
SHENYANG
SEA OF JAPAN
XINJIANG AUTONOMOUS REGION
INNER MONGOLIAN AUTONOMOUS REGION
Huang He
HUHHOT
BEIJING
KOREA (D.P.R.)
PO-HAI
GANSU
NINGXIA
AUTON. REG.
YINCHUAN
TIANJIN
HEBEI
SEA
JAPAN
KOREA (Rep.of)
L. Qinghai
QINGHAI
XINING
LANZHOU
TAIYUAN
SHIJIAZHUANG
SHANXI
SHANDONG
YELLOW SEA
JINAN
Yellow River
XI'AN
SHAANXI
ZHENGZHOU
HENAN
ANHUI
JIANGSU
NANKING
SHANGHAI
XIZANG AUTONOMOUS REGION
HEFEI
HUBEI
WUHAN
EAST CHINA SEA
SICHUAN
CHENGDU
HANGZHOU
ZHEJIANG
LHASA
NEPAL
SIKKIM
BHUTAN
Yangtse
NANCHANG
CHANGSHA
JIANGXI
GUIZHOU
HUNAN
FUJIAN
FUZHOU
TAIBEI
INDIA
GUIYANG
KUNMING
BANGLA-DESH
GUANGXI AUTONOMOUS REGION
GUANGDONG
TAIWAN
YUNNAN
Sikiang
GUANGZHOU
NANNING
Pearl River Delta
HONGKONG
MACAO
BURMA
VIETNAM
SOUTH CHINA SEA
LAOS
HAINAN
PHILIPPINES
THAILAND
0
500
1000 Km